foot interval thus giving the result 8.1×10^{-7} cal/cm^2 sec. for the flow of heat.

The figures obtained in these calculations of heat are low compared to the results of Bullard and Krige in South Africa and Benfield[6] in England. In South Africa the surface flow range obtained was $9.5 - 15.2 \times 10^{-7}$ cal/cm^2 sec., mean $11.6 \pm 0.09 \times 10^{-7}$ cal/cm^2 sec.; in England, $6.8 - 15.3 \times 10^{-7}$ cal/cm^2 sec., mean $9.8 \pm 0.17 \times 10^{-7}$ cal/cm^2 sec. If the conductivities of the rocks were measured either in situ or in the laboratory and found to be larger than those used in obtaining the results just given the values of heat flow would of course be larger. Over the potash-bearing area of New Mexico, Richardson and Wells[7] obtained 45 cal/cm^2 yr. for the flow of heat to the surface through the anhydrite and associated formations, or, converted to the units of this paper, 14.4×10^{-7} cal/cm^2 sec. The conductivity of the anhydrite and other rock was assumed to be 12.3×10^{-3}.

The somewhat lower heat flow near the surface is probably related to the larger infiltration of water near the surface.[8] In the first 1,000 feet of the Empire mine, about 670 gallons of water a minute are pumped to the surface, and this flow of water could conceivably be the main cuase of the lower temperature gradient and the slightly smaller heat flow in the upper section of the mine.

PALEONTOLOGY.—*Note on a vertebra of* Palaeophis *from the Eocene of Maryland.*[1] S. F. BLAKE, Arlington, Va.

The comparative rarity of fossil remains of snakes makes it desirable to place on record a nearly perfect anterior thoracic vertebra of *Palaeophis* which I collected in 1937 at the well-known Eocene locality at Popes Creek, Charles County, Md. The vertebra was found in the greensand at the very base of the cliff near its upper end, and is therefore to be referred to Zone 17, Woodstock member, Nanjemoy formation (the upper formation of the Pamunkey group). It is the first specimen of this genus to be found in Maryland, and the most nearly complete specimen so far found in this country.

The only Eocene snakes known from the east coast of the United

[6] BULLARD, E. C. *Heat flow in South Africa.* Proc. Roy. Soc. London, A173 (955): 474–502. 1939.
KRIGE, L. J. *Bore-hole temperatures in the Transvaal and Orange Free State. Ibid.:* 450–474.
BENFIELD, A. E. *Terrestrial heat flow in Great Britain. Ibid.:* 428–450.

[7] RICHARDSON, L. T., and WELLS, R. C. *The heat of solution of some potash minerals.* Journ. Washington Acad. Sci. 20: 243–248. 1931.

[8] JOHNSTON, W. D., Jr. *Op. cit.*

[1] Received August 9, 1941.

States, according to Gilmore's monograph,[2] are four species of *Palaeophis*. Three of these, *P. littoralis* Cope, *P. halidanus* Cope, and *P. grandis* (Marsh), are known altogether from only about 6 thoracic vertebrae from the Eocene greensands and marls of New Jersey (Manasquan marl, Vincentown lime, and (probably) Shark River marl). The fourth, *P. virginianus* Lynn, is known from two thoracic vertebrae, one fairly complete, the other very imperfect, collected by Dr. W. G. Lynn on the shore at Belvedere Beach, below the mouth of Potomac Creek, King George County, Va., almost directly across the Potomac River from Popes Creek. These specimens are ascribed to the Aquia formation (the lower formation of the Pamunkey group), which forms the bulk of the deposits at this place. Four additional species of *Palaeophis* are described from the Eocene of England, and one from the Eocene of Belgium. As is the case in most groups of

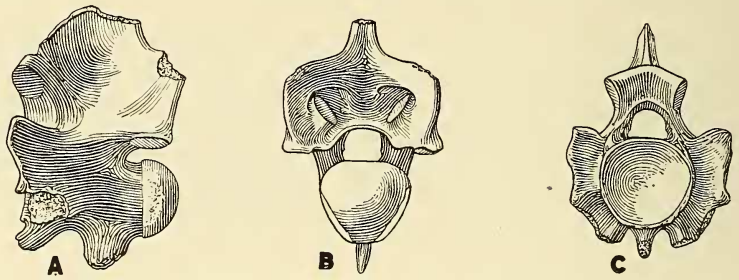

Fig. 1.—*Palaeophis grandis* (Marsh). Specimen from Popes Creek, Md.: *A*, lateral view; *B*, posterior view; *C*, anterior view. Natural size. Drawn by Sydney Prentice.

fossils known chiefly or entirely from vertebrae, there is doubt whether all the described species are actually distinct.

Gilmore temporarily retains the four described American species of the genus but hints his suspicion that the characters employed in his key are partly or wholly correlated with differences in position in the vertebral column. The vertebrae of the three New Jersey species are distinguished among themselves principally by differences in size, obviously not a good basis for specific distinction when their relative position in the backbone of a 15- or 20-foot snake is unknown, as is also the stage of maturity of the individuals from which they came. *Palaeophis virginianus* stands apart on at least two definite features, its single hypapophysis and its much less extensive neural spine, but these differences also might conceivably be due to differences in position in the vertebral column.

I have been able, in company with Dr. G. G. Simpson, to compare

[2] Gilmore, C. W. *Fossil snakes of North America.* Geol. Soc. Amer. Spec. Pap. 9: 4, 46–56. 1938.

the Maryland vertebra with two vertebrae in the American Museum of Natural History, apparently all that now exist of the three on which *Palaeophis littoralis* Cope was founded. One of these is the comparatively complete specimen figured by Cope, the other too imperfect to be of any value for comparison. The Maryland specimen is about twice the size of the better New Jersey one, but no structural difference of undoubted specific significance is evident. A single vertebra (U.S.N.M. no. 11753) from Vincentown, N. J., referred by Gilmore to *P. littoralis*, is so similar to the Maryland specimen that it is difficult to imagine any specific difference, but it is distinctly smaller.

The single known vertebra of *P. halidanus* Cope, of which I have seen only the illustration, is so fragmentary that satisfactory comparison is impossible, and Gilmore doubts that other specimens can ever be identified with it. The single known vertebra of *P. grandis* (Marsh), of which also I have seen only the figures given by Gilmore, has the hypapophyses represented only by scars and is otherwise more incomplete than the Maryland vertebra, as well as somewhat larger, but on the whole agrees so well with my specimen that it seems permissible to refer the latter to it, at least provisionally. At the same time, I wish to indorse the implicit suggestion in Gilmore's monograph that the three described species from New Jersey really represent only one, although the Virginian species may be distinct. As regards the New Jersey species, at any rate, whatever external or internal distinctive characters the snakes in question might have presented to a contemporary zoologist, the differences observable in their preserved remains are no greater than might be expected in different parts of the vertebral column of a single specimen of such size (around 20 feet) as these animals are supposed to have attained.

I am indebted to C. W. Gilmore for assistance in the preparation of this note, as well as for obtaining the services of Sydney Prentice to make the drawings that illustrate it. The specimen has been placed in the U. S. National Museum (no. 15888). It measures: Div. Vert. Paleont.).

Greatest height	33.8 mm
Width across prezygapophyses	21.5 mm
Length of centrum (edge of glenoid cavity to end of condyle)	20.2 mm
Least width of centrum (near middle)	9.2 mm
Distance from top of zygosphene to lower margin of glenoid cavity	21.2 mm
Height of glenoid cavity	11.0 mm
Width of glenoid cavity	11.8 mm
Height of condyle	10.5 mm
Width of condyle	11.7 mm
Distance between extremities of pre- and postzygapophyses	21.6 mm
Distance between extremities of right and left postzygapophyses	20.1 mm
Height of neural canal in front	5.3 mm
Width of neural canal in front	8.7 mm
Greatest width of zygosphene	11.2 mm